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British Journal of Anæsthesia

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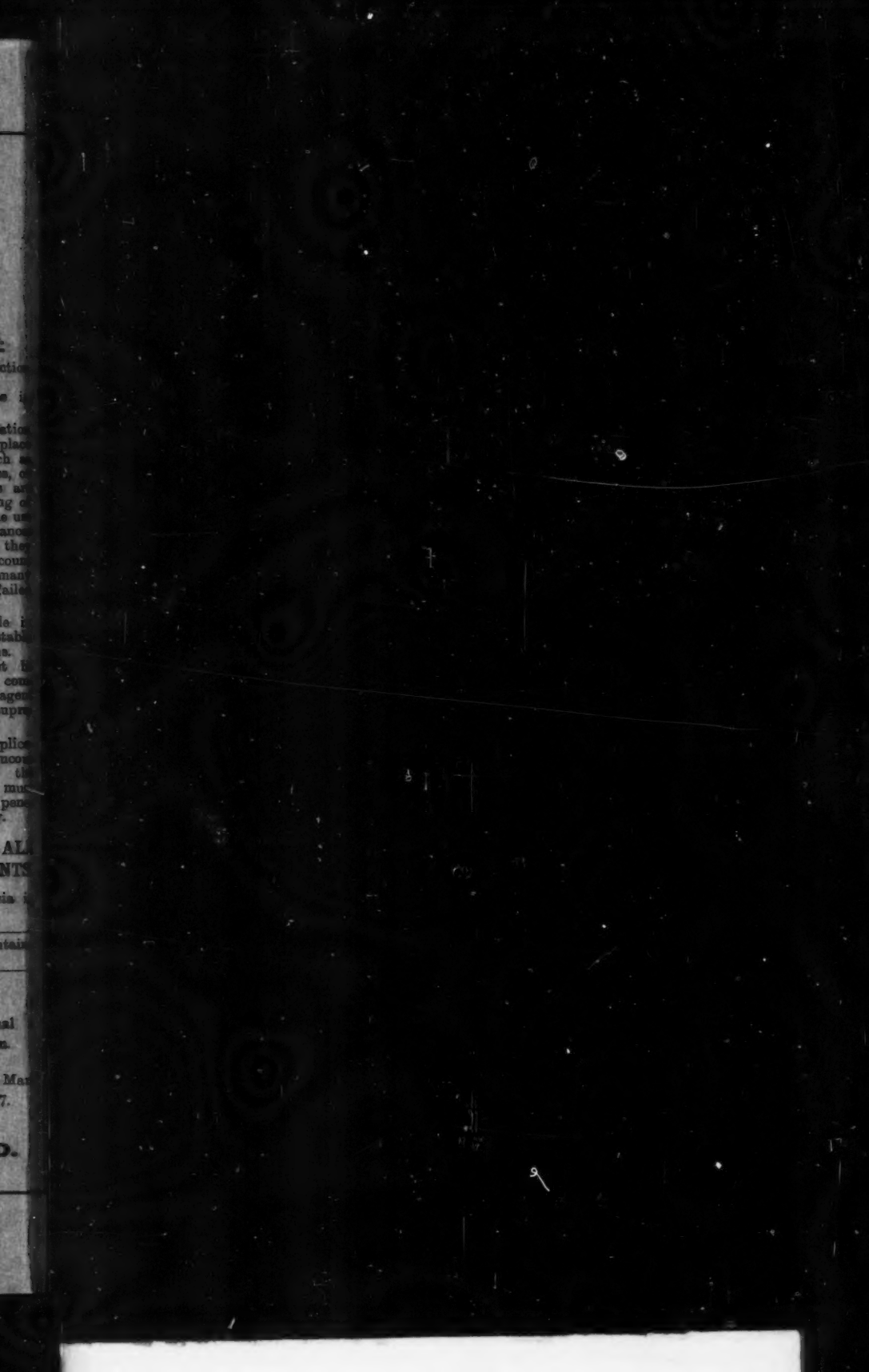

British Journal of Anæsthesia

Editor

H. M. COHEN, M.D. (U.S.), M.R.C.S., L.R.C.P.

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British Journal of Anæsthesia

Vol. I. No. 1. July, 1923.

FOREWORD.

WITH this Number, the "British Journal of Anæsthesia" makes its debut as a publication devoted entirely to the interests of Anæsthesia and its practitioners. That there is need for a Journal of its character is amply demonstrated by the hearty support received in many quarters, and it thus, optimistically, takes its place amongst those special Medical periodicals which are representative of a particular branch of Medicine or Surgery.

As regards the future it should be stated that it is hoped to be able to keep abreast of the times in all that appertains to Anæsthesia, and to reflect the progress our Speciality is making everywhere.

In a word, the "British Journal of Anæsthesia" anticipates acting not only as the mouthpiece for those who desire to give public expression to the results of their research and experience, but to place before its readers an account of what is being done generally in the anæsthetic world.

Thanks to the confidence vouchsafed by the Guarantors, and to the encouraging support of our advertisers, the financial arrangements for the first year are assured. The Journal is thus happily launched upon its journey with hopefulness and good cheer.

To make the Journal of the greatest value to its readers, each Number should contain a summary of contemporary thought and achievement. To accomplish this end it has been decided to include, in addition to short Editorials, as broad a variety of original articles as possible.

In this Number we are especially fortunate in having the Historical Aspect of Anæsthesia discussed by Sir D'Arcy Power. It is obviously desirable to learn the views of those across the Atlantic, and we are privileged to include as a contributor Dr. James T. Gwathmey, of New York, the Founder and First President of the American Association of Anæsthetists, which now has a membership of 1,200. The Bibliography of Current Anæsthetic Literature and Programmes of Foreign Societies are intended to place before our readers the trend of the latest research and thought of the day.

* * * * *

The question of organization for the general body of Anæsthetists must sooner or later present itself in a concrete form. There is always the possibility of finding ourselves in a position where it becomes necessary to exert an influence commensurate with our numbers, and to attempt to do so, except as a united entity, would more than likely meet with failure.

If there is strength in unity there is surely futility in the reverse.

At a recent meeting of the Anæsthetic Section of the Royal Society of Medicine, the matter of Coroners' Inquests in relation to all anæsthetic fatalities was discussed. There was manifest a marked difference of opinion as to the necessity of these public examinations following every ordinary case, and it was made evident that there is ample room for reform.

Questions of this nature, and others, could be influenced to a great extent by a united organization. Placing aside purely legal matters, the scientific, educational and economic aspects of the Practice of Anæsthesia demand discussions which are only possible in assemblies of those especially interested in that branch of Surgery.

With the exceptions of the Section in London and the Society in Scotland, the great majority of the something like 500 Practitioners of Anæsthesia have no affiliations with similar bodies.

A suggestion to be considered in this connection is the formation of a Midland Society to comprise the Anæsthetists of Birmingham, Bristol, Derby, Leicester and Cardiff; a

North of England Society to consist of Manchester, Liverpool, Leeds and Sheffield; and others according to geographical divisions.

These, with London and Scotland, and, ultimately, the Dominions, Colonies and Dependencies, should form the basis of a general organization, viz., the British Association of Anæsthetists.

This may, no doubt, be regarded as a somewhat ambitious programme, but, in truth, it only parallels similar activities elsewhere.

Such organisations as the Ophthalmological Society, the Pathological Society, the Psycho-Neurological Society, and the Oto-Laryngological Society are examples of successful, country-wide associations of specialists; yet probably not one of these has a greater field to draw from than the grand total of anæsthetists in the same area.

It is a self-evident fact that anæsthetists united in one large, virile body can do much to advance the science and practice of anæsthesia, and it behoves those of us who are alive to the *possibilities* of unity to give the matter attention and thought.

THE EDITOR.

EARLY ANÆSTHESIA.

By Sir D'Arcy Power, K.B.E., F.R.C.S. (Eng.),
Past President of the Section of the History of Medicine of the Royal Society of Medicine.

IT is fitting that the "British Journal of Anæsthesia" should contain some reference to the earlier means of causing insensibility to pain although the history of anæsthesia can never be properly elucidated. It is inextricably bound up with the problems of hypnosis, hysteria, charlatanism and the mentality of nations at different epochs which has not yet been the subject of study by competent scholars even for classical times. Opium, Indian Hemp and Alcohol were used from a very early period for the purpose of deadening pain, and they continued in use until the introduction of modern anæsthetics in 1846. But they were probably only employed in exceptional cases because even to our own time the avulsion of a toenail, the opening of an acute abscess of the breast, the incision of a whitlow and the removal of enlarged tonsils were not deemed worthy of an anæsthetic.

Nepenthe, the drug used by the Egyptians to alleviate pain, was probably opium or Indian hemp, and Indian hemp was certainly used both in Scythia and in China in the form of inhalation of the fumes to produce insensibility. Herodotus tells of the Massagetæ that "they light a fire, sit round in a circle and inhale the fumes of the burning fruit." Helen too in the Odyssey "cast a drug into the wine whereof they drank, a drug to lull all pain and anger and bring forgetfulness of every sorrow. Whoso should drink a draught thereof, when it is mingled in the bowl, on that day he would let no tear fall down his cheeks, not though his mother and his father died, not though men slew his brother or dear son with the sword before his face and his own eyes beheld it." The knowledge of these herbs, Homer says, she had learnt from Egypt, where "each man is a leech skilled beyond all human kind." Hoa-tho, who practised in China, is said to have given his patients a preparation of hemp when he operated upon the bones, stomach or intestines. After a few

moments the patient became as insensible as if he had been drunk or dead, and Hoa-tho then made openings and incisions, amputated and removed the disease, brought the tissues together with sutures and applied dressings. The patient recovered after a certain number of days without having experienced the slightest pain.

The Greeks also used Mandragora infused in wine. They called it *Morion*, and Lucius Appuleius (*circa* 400 A.D.) states that half an ounce would cause so deep a sleep for several hours that a limb could be amputated without pain. The Jewish women used to give a draught of Morion to those who were crucified, and this may have been the " wine and myrrh " offered to our Saviour on the Cross. Mandragora, too, was an important constituent of the " sleeping apple " mentioned by Dioscorides (*circa* 40—90 A.D.), the " Father of Pharmacy." It was made with opium, mandragora, the juice of the water hemlock, the seeds of henbane and musk, and caused sleep when it was repeatedly smelt.

Albertus Magnus (1193—1280 A.D.) distilled fire-water from red wine and common salt. He may thus have produced a mixture of ether and alcohol capable of producing anæthesia by inhalation. A quintessence of several soporific herbs was also manufactured. It was so volatile that it had to be kept in leaden vessels well covered, and when the essence was inhaled it produced sleep without subsequent headache.

Theodoric (1205—1298 A.D.), Bishop of Cervia, gives the following directions for making " a soporific sponge " taught him, as he says, by his master Hugh of Lucca :—" Take of opium, of the juice of the unripe mulberry, of henbane, of the juice of hemlock, of the juice of the leaves of mandragora, of the juice of wood ivy, of the juice of the forest mulberry, of the seeds of lettuce, of the seeds of the dock which has round apples, and of the water hemlock, of each an ounce. Mix them all in a brazen vessel and then place a new sponge in it. Boil them all together for so long as the sun lasts in the dogdays and until the sponge absorbs all the liquid. Put it aside to dry and when it is required for use put the sponge in hot water for an hour and afterwards apply it to the face of the patient until he falls asleep. When the operation is finished soak another sponge in vinegar and let the patient

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breathe through it, or drop the juice of fenugrek into his nostrils; he will quickly awaken."

The surgeons of the fourteenth century seem to have depended upon local as well as general anæsthesia. John Arderne (1307—1380 A.D.) recommends "an ointment with which if any man be anointed he shall suffer cutting in any part of his body without feeling or acheing. Take the juice of henbane, mandragora, hemlock, lettuce, l lack and white poppy and the seeds of all these aforesaid herbs, if they may be had, in equal quantities; of Theban poppies and of poppy meconium one or two drachms with sufficient lard. Braize them all together and thoroughly in a mortar and afterwards boil them well and let them cool. And if the ointment be not thick enough add a little white wax and then preserve it for use. And when you wish to use it anoint the forehead, the pulses, the temples, the armpits, the palms of the hands and the soles of the feet and immediately the patient will sleep so soundly that he will not feel any cutting. Also from one grain to half a drachm of Theban opium dissolved in a pint or more of wine, according to the strength of the patient, will make him that drinketh it sleep. Also the seed of white henbane given alone in wine makes the drinker sleep at once and so soundly that he will feel nothing that is done to him. And know that it is well to tweak the nose, to pinch the cheeks or to pluck the beard of such a sleeper to quicken his spirits lest he sleep too deeply. Do in this wise to a man that is thus sleeping:—Put to his nose grey bread that has been toasted and is moistened with strong vinegar; or put vingear or mustard to his nostrils; or wash his head in strong vinegar; or anoint his temples with the juice of rhubarb; or give him some other sternutory and he will immediately wake up. And know that it is good to give him afterwards Castoreum, for Castoreum chafeth and most comforteth the chilled sinews (*i.e.*, nerves) and relieveth the paralysis. And also give him things that comfort the brain such as castor, musk, nutmegs, roses, nenufar, myrtle and sumac."

It seems clear from this extract that there was some systematic method of anæsthetising patients in England during the fourteenth century. John Arderne was an operating surgeon practising amongst the higher classes at

a time when chivalry was at its highest; his patients lived luxurious lives and probably felt pain as acutely as we do ourselves. They were also extremely credulous, and hysteria was common. A very slight degree of real anæsthesia, coupled with a profound belief in its efficacy, might therefore have been sufficient to obtain the results claimed by Arderne.

It was far different with their children and grandchildren. Constant wars and civil troubles toughened their moral fibre and rendered them callous to the sufferings of others and apparently to their own pain. Nothing is heard of any attempts at anæsthesia during the wars of the Roses or under the Tudors or Stuarts. The gentle surgeon had passed away and was replaced by a rough, honest type who looked upon pain, if he thought of it at all, as a divinely ordained consequence of his handiwork which it would be impious to alleviate. No attempt was made to minimise it for even so detailed a writer as Samuel Pepys looked back to what must, in his case, have been a prolonged lithotomy operation without any mention of unconsciousness. He was just tied up and cut for stone.

The revulsion came as much from the surgeon as the patient. We read of Cheselden (1688—1752) being sick at Guy's before his operations, and of Abernethy (1764—1831) vomiting at the thought of what he had to go through at every major operation.

As the science of chemistry advanced various tentative but fruitless attempts were made to produce anæsthesia. Pearson at Birmingham in 1785, Humphrey Davy in 1799 at Bristol, Dr. Warren at Boston in 1805, Michael Faraday in London in 1818, and Christian in Edinburgh in 1836 were paving the way for anæsthesia by their experiments with sulphuric ether or with nitrous oxide, but it was not until 1844 that Horace Wells drew especial attention to the value of laughing gas in dentistry, nor until 1846 that Dr. Morton etherised a patient for Dr. J. C. Warren at the Massachusetts General Hospital. From that time onward the progress of anæsthesia was uninterrupted, passed rapidly through the necessary period of empiricism and soon entered upon the scientific stage which it is the endeavour of the present Journal to develop.

PAINLESS CHILDBIRTH BY SYNERGISTIC METHODS.*

A Preliminary Report.

By E. P. Donovan, M.D.,
House Surgeon, Fifth Floor, Lying-in Hospital, New York, N.Y.,

and James T. Gwathmey, M.D.,
New York, N.Y.

MYTHOLOGICAL, profane and sacred literature abound in incident, fact and fancy, showing that from the dawn of history man has sought to assuage grief and pain by some means of dulling consciousness.

Both the Bible and Talmud contain references to the ancient practice of inducing sleep by artificial means. In these attempts many methods and diverse agents have been employed. The inhalation of fumes from various substances, weird incantations, the external and internal application of drugs and many strange concoctions, pressure upon important nerves and blood vessels, mesmerism, hypnotism, etc., have all played their part in the evolution of anæsthesia. But modern anæsthesia was not known to the world after the successful public demonstration of ether by Morton in 1846.[1]

One of the first uses to which it was put was to modify the pains of childbirth. Sir J. Y. Simpson[2] of Edinburgh, was the first to use ether in obstetrical cases, but not entirely satisfied, sought a substitute, and to him we are indebted for the second most universally used agent for general anæsthesia—chloroform. Common sense prevailed over the opposition of clergy and laity of his day, "to avoid one part of the primeval curse on women," and chloroform and ether are now used almost universally for special cases and in certain stages of labour. However, where expense is not considered, nitrous oxide and oxygen have supplanted the use of these agents.

In 1880, Klikowitch[3] of St. Petersburgh, recommended an

* Read before the Atlantic City Medical Society, Friday, May 11, 1923.

80 per cent. mixture of nitrous oxide and oxygen for obstetrical purposes, and this is about the admixture that is used to-day for analgesic purposes. Guedel of Indianapolis was one of the first to endorse strongly this combination in normal labour in the United States (1911), and it is now quite generally employed.

Spinal analgesia has been used with success—as have also local analgetics to the cervix, the perineum and the rectum, but these methods have but few followers to-day.

Schneiderlin, in 1899, recommended the use of morphin and scopolamin for surgical anæsthesia, but Steinbuchel first recommended its use in labour in 1902. Kronig and Gausse of Freiburg are responsible for its introduction into the United States, reporting 3,000 cases in a paper read in Chicago in 1913. Kronig and Gausse use narcophin, a proprietary narcotin—morphin meconate. There is a good reason for using this combination, and those who do not have no right to condemn or criticise "twilight sleep." Sollman states (p. 260), "Narcotin has a considerable potentiating action on morphin. With hypodermic injection 5 mg. of morphin produced no measurable analgesic effect, with 10 mg. the analgesia was marked in two subjects, the third responded by hyperæsthesia. With narcotin 8 mg. was ineffective, 20 to 40 mg. produced first some hyperexcitability, then slight analgesia.

With a mixture of equal parts of morphin and narcotin containing 3—1/3 mg. the analgesia was almost as great as with 10 mg. of morphin alone. This combination was also effective on the subject who resisted morphin." (p. 267.) "Morphin probably tends to delay the progress of labour by its psychic sedative action, largely by preventing the reinforcement of labour pains by the contraction of the abdominal muscles."

This system has been in turn praised and condemned; to-day it is practically abandoned except by Kronig and Gauss and a few specially equipped sanataria. Sollman further states, "the use of scopolamin-morphin anæsthesia is justified (if at all) only in specially equipped institutions and not in private practice, or even in ordinary hospitals." It is applicable only in about 30 per cent. of labour cases.

All of the above agents and methods require either a specialized technique, unusual equipment or trained personnel. Numerous inquiries from many sources indicate that none of these methods are satisfactory to the majority of physicians.

The development of painless labour by synergistic methods was undertaken from a purely scientific and altruistic viewpoint. It was decided that the method should be so simple that it could be used either in the home or hospital, and by any physician, in an entirely empirical manner. The ideal sought was a state of relaxation and analgesia with consciousness but little if at all impaired, so that full co-operation might be had at all times. The methods by which this condition was to be obtained were outlined to the chief and attending obstetricians of the N.Y. Lying-in Hospital, Asa B. Davis and George W. Kosmak, and were as follows:—

(1) To start with a minimum dose at which time no definite results were expected and to gradually increase the dose until definite results were obtained.
(2) To stop at any time in the development of the technique if either mother or child appeared to be in danger.
(3) To publish the results whether favourable or unfavourable.

With this understanding work was commenced on the 10th of February. The first four cases showed practically 75 per cent. failure. To-day the first chapter of painless labour by synergistic methods is completed when we can secure over 75 per cent. success. By "success" is meant the amelioration of pain to such an extent that patients state that they were "helped"—only a few of the 75 per cent. had a comparatively painless labour. By "failure" is meant whenever the patient obtained no relief from the method. At no time was the mother's condition imperilled in the slightest degree. Only in one instance did the infant seem to be affected. Whether or not this was from the medication cannot be stated positively, but it seemingly was. In the first series of drugs used there was not only failure but delay. This delay was in a measure corrected by placing 10 grains of quinine hydrochloride in the mixture. Sollman states that "satisfactory

results have been reported from its use in all stages of labour. This drug stimulates the contractions and increases the tone of the uterus."[4] Since this addition in only one or two cases has there been any delay, and in these exceptional cases exhausted nature was more powerful than the drug.

There also seemed at one time to be an increase in the nausea and vomiting. This was corrected in a very great measure by eliminating urethan and paraldehyde, thus also making the final mixture simpler. The other drugs considered fundamental to the scheme are magnesium sulphate, urea, ether and morphin. Two to four drachms of the magnesium salts is the maximum dose used in our investigations of painless labour, although the writer has used two ounces of the salts per rectum in other cases without deleterious effect. The magnesium sulphate must be chemically pure (the usual commercial product may cost fivepence per pound, the chemically pure four shillings per pound).

Weston and Howard[5] have injected 2 cc. or more of a 50 per cent. solution of magnesium sulphate subcutaneously or intramuscularly more than a thousand times with no local pain or sloughing. They state the sedative action occurs in 15 to 30 minutes and lasts from five to seven hours, and is found to be a very good substitute for morphin and hyoscin. In a few instances the patient became quiet but did not sleep. In 82.7 per cent. it was effective. In 6 per cent. the dose was repeated before sedation occurred. In 11 per cent. no effect even after three or more doses.

Rector[6] has used magnesium sulphate colonically in doses of two drachms in over 300 cases. The Presbyterian Hospital used the salts over 200 times by hypodermoclysis in four drachm doses with good results. In both instances other drugs or agents were added to complete the analgesia or anæsthesia.

Magnesium sulphate used in two to four drachm doses by rectum leaves a margin of safety amply sufficient to satisfy the most critical and is, next to urea, probably the safest drug in the combination.

In a personal communication, Alma J. Neill, Professor of Physiology, University of Oklahoma, states: "I have found that the rate of diffusion of the magnesium sulphate with urea

was rather constant; that is, the range was between 30.9 and 32.1 per cent. with the exception of a 6 per cent. solution of the magnesium sulphate and a 1 per cent. solution of the urea which diffused very much faster, it having diffused 48.1 per cent. in the same time. The whole range of percentages were used both with the magnesium sulphate and the urea. Each time the 6 per cent. solution of the magnesium sulphate and the 1 per cent. solution of the urea diffused practically 50 per cent. faster than any combination or any other substance which I tried."

Hewlatt[7] has given 25 grams of urea every hour until 12 m. (100 grams in all) with no untoward results. Cushney[8] states: "It is rapidly absorbed from the intestine and is practically devoid of action in the tissues even in the larger doses." The amount used, 1 per cent. of a 4 ounce mixture, is therefore negligible as far as danger is concerned. It is use with the idea that it increases the absorbability of the magnesium sulphate. The exact relation between "diffusion" and "absorbability" is not definitely known, nor can we state at this time how much the efficiency of the method is due to the urea.

"Ether[9] is the anæsthetic of choice if the patient is suffering from any form of toxæmia or requires stimulation or is suffering from shock." The amount used in our mixture, two to four drams to a maximum of one and a half ounces, needs no extended comment. (Four to six ounces of ether is the amount used in colonic anæsthesia.)

Ten years after its introduction for general surgery oil-ether was first systematically treated in 100 obstetrical cases by Thaler and Hübel.*

The mixture was 90 grams (3 ounces) of ether and 120 grams (4 ounces) of olive oil. The amount used at one injection was 100 cc. (3 ounces) introduced very slowly. In a typical case, a few minutes after injection, the eyelids close and a general relaxation sets in. The condition is suggestive of twilight sleep, but if there is no marked effect after ten minutes a second injection of 50 cc. ($1\frac{3}{4}$ ounces) is given. In only one case was the method entirely impractical. With this

* *Zentralblatt für Gynäkologie*, Leipzic, 47, 337—384 (March 3, 1923).

one exception there was no complaint of pain or irritation of intestine.

In 16 cases this injection (50 cc.) was repeated once.
" 25 " " " " twice.
" 20 " " " " three times.
" 15 " " " " four times.
" 12 " " " " five times
" 4 " " " " six times.
" 2 " " " " seven times.
" 1 " " " " eight times.

In one case the maximum total amounted to 767 cc., of which 270 cc. were lost. No rectal irritation.

In 88 cases the results were satisfactory.
" 4 " there was absolute failure.
" 80 " normal or very strong labour contractions.
" 20 " labour was reduced or retarded. In these cases quinine or pituitary extract was added.

In some cases the labour seemed to be improved by the oil-ether mixture.

In 73 primiparas average duration of birth $20\frac{3}{4}$ hours.
" 27 multiparas " " " $10\frac{1}{4}$ "

No anomalies of the after-birth period were observed. No change in fœtal heart beat. Usually born pink.

In 84 children condition normal—cried immediately.
" 14 " " apnœic—breathed normally in five mins without resuscitation.
" 2 cases typical asphyxia, one revived and second—forceps—was not resuscitated.

In the majority of cases during the intervals between labour contractions, the patients lay as if asleep, during labour contractions slightly restless and groaned occasionally.

The time of rectal instillation :—

In 24 cases the os was dilated 1—4 fingers
" 27 " " " 3 fingers.
" 9 " " " 4 fingers.
" 3 " " " more than 4 fingers.

No morphin or alkaloids were used. In no case was there excitement. Vomiting in five cases. Strong thirst in seven cases. After delivery a deep sleep. Upon awakening do not recall any incidents. Of 99 born alive, one child died on fifth day, after third day intestinal inflammation and subsequently pneumonia. Some children were sleepy during the first one or two days. Ether by inhalation in comparison with this method affects the brain too much.

The disadvantage might be the impossibility of exact dosage on account of loss, but according to the writers the difference of individual reactions makes exact dosage irrelevant. The method is impractical in private homes.

To revert to the synergistic method again the next drug to consider is

Alcohol. The ounce of alcohol was used principally as a vehicle for the ether; it also increases the absorbability of the mixture. Alcohol is below ether in analgesic qualities. *Three-eighths* of a grain of morphin per rectum (in our opinion) is the limit for this drug. The hyoscin is used to accentuate the value or to synergise the morphin.

" The exaggeration of the effects of small doses of morphia which results from its combination with scopolamin is of great practical importance. This synergism may be experimentally demonstrated in various species of animals, especially in those species in which scopolamin alone, even when given in large amounts, produces no narcotic effects. The combined administration of small doses of morphin and small doses of scopolamin, which by themselves produce hardly any effects, results essentially in an exaggeration of the effects of morphin. (Burgi, Madelung.) Morphin and the hypnotics of the alcohol group when administered simultaneously also act synergistically, with a resulting exaggeration of each other's pharmacological actions." (Burghi, Fuhner.)[10]

The Method.

It is the exceptional patient who is so unfortunate as not to have received instructions, among other things, to keep the lower bowel clean, especially in the last stages of labour. The rule at the Lying-in Hospital is to examine and give a cleansing enema when admitted to the hospital. The patient

is then sent to the floor where delivery takes place. The patient is therefore already prepared for the colonic administration of the drugs used, and this is the method adopted. A six ounce mixture seemed preferable, but was too frequently expelled, therefore a four ounce mixture is the final choice.

Time.

In selecting the time for the rectal instillation we seemed to follow naturally the Freiburg method, which is as follows: "After labour is well on its way, when the pains are four or five minutes apart and lasting thirty or more seconds, the first injection (hypodermic) is made." It is at this time that the rectal instillation is given whether in a four ounce mixture or in divided dosage of two ounces. The effect is noticeable about the same time as a hypodermic would be and is not as painful. Analgesia is present in from thirty minutes to one hour after the administration, even in those cases in which a delayed action occurs.

Suitable Cases.

In the development of this method great care is being taken in rejecting cases that would in any way obscure the issue. For instance, if the uterus is dilating evenly and the contractions occur regularly, but with little pain, no medication is given; an even and sometimes painless delivery is then assured; or, when the cervix is fully dilated (four fingers or more) medication is withheld. Again, if the fœtal heart sounds are irregular or bad, or malpositions occur, or if there is any question about the condition of the child, medication is withheld. After starting this method a patient with indistinct fœtal heart sounds was admitted to the hospital. Medication was withheld and the child delivered, but died within forty-eight hours. If the method had been tried in this case it would have properly come under suspicion. The cases selected were those not too far advanced and where there was a possibility of helping them. The selection or rejection of these cases necessarily fell upon the house surgeon of the Lying-in Hospital to whom full credit is herewith given in exercising unusually good judgment.

Results.

The results have varied, but in the majority of cases the patients have been "helped," the "pains were lessened," and in a few a comparatively painless delivery has occurred. Others were not helped in the slightest, whilst one or two stated that the pains were "intensified." This last statement can only be accounted for by taking into consideration the mentality of the patient who possibly expected very great help and received but little.

Formulæ Used.

In the evolution of this method the various formulæ used and the results, together with Donovan's notes on the cases, are herewith given :—

No. 1. February 10th, 1923.

Morph. Sulph.	gr. $\frac{1}{4}$
Hyoscin Hydrobrom.	gr. 1/200
Sol. Mag. Sulph. 50% C.P.	1 ounce
Aqua Destill.	$\frac{1}{2}$ ounce
Alcohol q.s.	2 ounces

Used on four patients. Dose repeated in one case and no relief. One case with one dose had a practically painless labour. Three cases had no relief.

No. 2. February 10th, 1923.

Glucose	4 drams
Morph. Sulph.	gr. $\frac{1}{4}$
Hyoscin Hydrobrom.	gr. 1/200
Sol. Mag. Sulph. 50% C.P.	4 drams
Egg	1
Alcohol	1 ounce
Pept. Milk q.s.	4 ounces

Used on three patients. One with one dose said pains were worse. Two cases each had two doses with no apparent relief.

Impression : Effect somewhat better than No. 1, but not marked.

No. 2 with ether added (2 drams) used on three patients. All stated that pains were relieved somewhat.

No. 3. February 19th, 1923.

Morph. Sulph.	gr. ¼
Hyoscin	gr. 1/200
Sol. Mag. Sulph. 50% C.P.	4 drams
Alcohol	4 drams
Pept. Milk	2 ounces

Given at 110° Fahrenheit.

No. 2.

Alcohol	4 drams
Ether	½ ounce
Yolk of egg	1
Pept. Milk q.s.	4 ounces

Used on eight patients. Four cases the pains were lessened, but all had long second stage. One baby was resuscitated with great difficulty. Condition appeared to be morphin apnœa. Four cases had no evident relief. Two delivered by forceps. *Impression*: Fairly good in four cases, but all had long second stage.

No. 4. February 26th, 1923.

Morph. Sulph.	gr. ¼
Hyoscin	gr. 1/200
Mag. Sulph. C.P.	3 drams
Glucose	2 grams
Pept. Milk q.s.ad.	2 ounces

Given at 110° Fahrenheit.

No. 2. Given forty minutes later.

Ether	1½ ounces
O. Olive	2½ ounces

Used on five cases. Three had no relief. One expelled part of the second dose. One case was "helped" a little. One case had great relief but a long labour.

No. 5. March 1st, 1923.

Morphin Sulph.	gr. ¼
Hyoscin Hydrobrom.	gr. 1/200
Mag. Sulph. C.P.	4 drams
Glucose	4 drams
Aqua Destill.	4 ounces

Given at 110°. Used on three patients with no relief. To one bottle, paraldehyde 3 drams were added. Patient slept all during labour. Had good progress, but vomited.

No. 6. March 8th, 1923.

Urea	1%
Mag. Sulph. C.P.	6%
Morphin Sulph.	gr. ¼
Hyoscin Hydrobrom.	gr. 1/200
Paraldehyde	2 drams
Ether	2 drams
Pept. Milk	6 ounces

Used on four patients. Two cases helped considerably. Two others noticeably. All vomited and had prolonged second stage. Did not retain six ounces so well.

No. 7. March 13th, 1923.

Urea	1%
Mag. Sulph. C.P.	6%
Morphin Sulph.	gr. ¼
Hyoscin Hydrobrom	gr. 1/100
Urethane	gr. 5
Ext. Cannabis Indica	gr. ½
Water q.s.	4 ounces

Used on six patients. No noticeable effect on three. Pains of one were lessened; two considerably relieved.

No. 8. March 19th, 1923.

Urea	1%
Mag. Sulph. C.P.	6%
Morphin Sulph.	gr. ¼
Hyoscin Hydrobrom.	gr. 1/100
Paraldehyde	2 drams
Ether	2 drams
Urethane	gr. 5
Pept. Milk	4 ounces

Used on two cases. Both were nauseated but rested and pains were lessened.

No. 9. March 20th, 1923.

Urea	1%
Morphin Sulph.	gr. ¼
Hyoscin Hydrobrom.	gr. 1/100
Mag. Sulph. C.P.	6%
Ether	2 drams
Paraldehyde	2 drams
Urethane	gr. 5
Quinine H.C.L.	gr. 10
Alcohol	1 ounce
Water q.s.	4 ounces

Used on four patients. No apparent effect from first two.

Alcohol added to last two; labour was prompt and pains eased a little.

No. 10. Same as above except Morphin gr. $\frac{3}{8}$. No paraldehyde.

Used on four patients. Three of these were helped decidedly. Other case could not be helped with anything.

No. 11. Same as No. 10.

Used additionally upon three surgical cases. All of them had only small amount of inhalation anæsthetic. One case expelled nearly all of the mixture, pains not diminished. One case slept all night after medicine; pains next day were weak and she had a long labour, but the medication gave a much needed rest. Two cases in active labour—one said pains were eased. One case pains were better for about six hours but labour was prolonged, and patient finally was delivered with forceps. Two cases both said pains were eased.

No. 12.

Urea	1%
Mag. Sulph. C.P.	2 to 4 drams
Morph. Sulph.	gr. $\frac{1}{4}$
Hyoscin Hydrobrom.	gr. 1/100
Glucose	4 drams
Aq. Dest. q.s. ad.	2 ounces

Heat to 110° F. Give as retention enema.

No. 2. Twenty minutes later give:

Ether	1½ ounces
Oil	6 drams

The amount of magnesium sulphate in the above formula varied from two to three drams for obstetrical cases, and to four drams for surgical cases.

One case, 3 drams, was "helped considerably."

One case, 3 drams, pains stopped, patient slept for nearly 20 hours then delivered promptly.

One case, 2 drams (2 omitted), no effect.

Two cases, 2 drams, both helped.

One case, 2 drams, "helped slightly" (slept about three hours), labour good.

Two cases (as written), both "helped."

One case (as written), could not be helped with anything. Rested for seven hours, but it apparently did not ease the pains.

REMARKS.

It is stated authoritatively "that no drug which can so far abolish sensation as to make labour painless can be given to this degree without affecting considerably the normal process of labour." We cannot entirely concur in this statement, although it seems to be the consensus of opinion of all obstetricians and of all authorities. (As yet magnesium sulphate alone has not been tested for confinement cases.) By using the minimum dose of a number of drugs synergistically it is believed that the above objection has been overcome. It must be remembered that when the four ounce mixture is placed into the rectum it is still practically outside of the body.[8] When absorbed into the blood it is only then a part of the circulatory system.

"In twilight sleep fœtal asphyxia occurs in 9.6 per cent. of cases, but fœtal mortality is not above the average."[9] In our series the percentage is less than 1 per cent. and this case was not fatal. The usual objections against twilight sleep: (*a*) prolonged labour for hours and days, use of forceps more often necessary, the percentage of ruptured perineums higher, failure of occipito-posterior positions to rotate normally, (*b*) restless delirium and violence, disturbance of heart and lungs, post-partum hæmorrhage and uncertain results do not seem to obtain with the present method.

In our series only in one case in 64 did asphyxia occur which gives a percentage of .64. As a general proposition "synergistic analgesia" is a safer condition than either oil-ether analgesia or "twilight sleep." In twilight sleep too much dependence is placed upon morphin and its action is too greatly stressed—hence the high percentage of asphyxia. With the synergistic method we attempt to secure relaxation with the magnesium sulphate as well as using it for its power of prolonging the effect of the morphin. Ether is a powerful stimulant and analgesic as well as an anæsthetic. The attempt is made here to use it only for its stimulating and analgesic properties, and we believe we obtain this by using it in the minimum dosage as given.

Incidentally, in the last formula 12, a very safe preliminary for surgical cases where full relaxation is required has been evolved. It is given one hour before the operation as a retention enema, and is put up as a four ounce mixture and supplemented by nitrous oxide oxygen-ether open method. It has been used in several hundred cases with satisfaction.

Conclusions.

We feel that in this small series of cases we have established the fundamental principles upon which painless labour may be safely worked out, *i.e.*, by using the minimum dose of a number of drugs, compatible and synergizing, using each drug for a definite and specific purpose.

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The term *synergistic anæsthesia* means the reciprocal augmentation of the action of one or more drugs upon one another with unconsciousness. *Synergistic analgesia* is the term employed when consciousness is present. When the agents are properly selected and used the resulted effect is much greater than the simple summation of their pharmacologic action.

J. T. Gwathmey.

SACRAL OR EPIDURAL ANALGESIA.

By J. Blomfield, O.B.E., M.D.

SACRAL analgesia has not yet been used to so large an extent in Great Britain as to render useless any further account of personal experiences, even if these do not involve a huge number of cases. Accordingly I have been through the notes made at the time whenever I have employed the method, and venture to put before the readers of this journal a brief account of the exact technique adopted and of the conclusions arrived at.

History.

The short history of this form of analgesia may be recalled in a few words. In 1903 Cathelin showed by experiment on animals in which cocaine was employed, that injections of a 1 per cent. solution of the drug into the sacral canal caused anæsthesia of the whole body. No real use of this fact could be made in human practice until less toxic drugs than cocaine were available. In 1900 epidural injections of novocaine were employed to reduce the pains of labour. Stoeckel injected 30 cc. of a ½ per cent. solution. In the following year, by using larger amounts and a stronger solution, Loewen produced an analgesia which sufficed for operations on the perineum and genitals.

A paper by Captain S. R. Meaker, in the *British Medical Journal* of May 10, 1909, gave a good account of technique and results. Since then numerous cases have been recorded, and the method has been widely employed for operations on or investigations of the anus and rectum, the urethra and bladder. By using small amounts of injection minor procedures in these regions have been safely conducted in out-patient practice. Of this I have had no experience, nor do I think it is a proceeding to be recommended.

Albert Scholl, in the *California State Journal* for December 1922, giving experiences in urology with sacral analgesia, recommends novocain with bicarbonate of sodium. His formula is:—

Sod. bicarb.	0.15 grm.
Sod. chlor.	0.1 grm.
Novocain	0.6 grm.

According to Scholl, adding sodium bicarbonate causes the solution to diffuse more readily through the nerve sheaths, the result being a more intense analgesia with less chance of failure.

Preliminary narcotics. When no hypodermic injection is used beforehand injection into the sacral canal may cause considerable pain as well as a good deal of uneasiness and restlessness. It has always appeared to me paradoxical that there should be any pain associated with a process intended mainly for its prevention. To hurt a man while providing him with anæsthesia is ridiculous. Consequently I have always employed preliminary narcotics freely before sacral analgesia. As a general rule omnopon gr. $\frac{1}{3}$, scopolamine gr. $^1/_{100}$, atropine gr. $^1/_{120}$, have been given in one injection an hour and a half before the time of operation, and omnopon gr. $\frac{1}{6}$ half an hour before. These injections have rendered some patients drowsy and quite indifferent to the sacral injection. Others have been much more slighly influenced, but although not at all drowsy have endured the sacral injection with an indifference that is wanting in those who have had no preliminary narcotic at all. The only occasions when a preliminary narcotic may be omitted are when a minor proceeding is to be carried out on a man who is not of a nervous disposition.

Preparation.

The patients have always been prepared as regards food in the same way as though a general anæsthetic were to be administered. This appears wise in employing a method that still provides, even in most skilled hands, as large a percentage of failures as 15 per cent. Moreover, the preliminary narcotics prevent any noticeable desire for food by the time of operation.

Position. The patient lies comfortably on one side. If the operation is a lateral one, *e.g.*, for an inguinal hernia, it is best for him to lie on the side to be operated on. For piles, bladder operations and the like, he may lie on which side he prefers. The thighs should be a little flexed and the back a little rounded, but there is no need, of course, to aim at the extreme arching which is desirable for spinal injection. Some authorities prefer the patient to lie prone, with the lumbar and dorsal spine raised above the level of the sacrum. This position is not nearly so easy for the patient, and as making the injection occupies a considerable time in some cases it is essential that the position should be one that

is easily and comfortably maintained. I have found no reason to give up the side for the prone position, and when there has been difficulty in finding or entering the sacral hiatus this has not been removed by putting the patient on his face.

Accessory details.

It is important that every disturbing element should be absent from the patient. The more completely his special senses are left entirely unstimulated the easier is it to bring about a satisfactory analgesia. Thus his ears may with advantage be lightly packed with cotton wool, and a towel folded across his eyes. He should lie on the table on which the operation will be performed so that there is a minimum of movement of his body after the injection has been made. Several observers have met with violent convulsive attacks after sacral injections, and Rood informed me that in his opinion attacks of this kind had been brought on by moving the patient. At any rate, none of my subjects have been affected in this particular way, and we have always laid stress on the importance of moving the patient after injection as little and as gently as possible. These epileptiform seizures are attributed by some to too large an amount of solution being used, but I have injected 200 cc. without any disturbance of the kind. The convulsions are accompanied by some cyanosis, and should be treated by administration of oxygen.

To make the injection. The skin is cleaned with iodine over the sacral spines down to the anal cleft. Sterilized towels surround the buttocks, perineal and sacral areas, and the anæsthetist's hands are carefully cleansed. With his left forefinger he defines the sacral hiatus by feeling the depression between the cornua of the sacrum. This pit he will generally find about an inch above the tip of the sacrum felt at the upper end of the anal cleft. Keeping his finger over the hiatus he takes the hypodermic syringe in his right hand and injects a few drops into the skin, guided by the pulp of his left forefinger. The needle used for this purpose is the ordinary slight one of a hypodermic syringe. Now he takes the needle of a Record syringe, at least a couple of inches in length, and pushes it through the skin at the spot where he has already made his injection. At the depth of about half an inch or less he will pierce the membrane guarding the sacral hiatus. He then lowers the shaft of the needle till it lies in the axis of the sacral canal and pushes it upwards for about an inch and a half. If he is properly in

the sacral canal he can move the needle easily from side to side, but scarcely at all from before backward. This being so, he attaches the Record syringe and slowly injects the solution. The ease with which this runs in affords a further proof that the needle is properly entered into the canal. Also no visible swelling is produced even when large quantities of solution are run in. On the other hand, if the needle is not in the canal it is either very difficult to force in the solution or else a superficial swelling rapidly appears and increases with the increased injection. It is quite easy to break the needle in the firm fibrous tissue bordering the sacral hiatus, and for this reason no force must be used in trying to make the needle travel onward. If it does not go easily, or if blood flows at once showing that a vein is entered the needle should be withdrawn and a fresh entrance made.

The implements necessary are :—

(1) Sterilized basin holding 100 cc. of 2 per cent. freshly made stovaine solution, to which have been added 20 drops of 1 in 1000 adrenalin.

(2) Record syringe to hold 20 cc., fitted with needle two inches long.

(3) Small hypodermic syringe and needle holding 5 cc. of the solution.

The amount of solution to be injected should vary in accordance with the site of the operation to be performed. The higher the level of the body at which this is situated the greater must be the amount used. At the same time it must be remembred that even when analgesia is required only for the anal area, or the urethra, failure is more likely if only small amounts of solution are injected. In my own experience 30 cc. of a 2 per cent. solution has been the minimum with which satisfactory analgesia has been obtained. When a weaker solution is used analgesia takes longer to appear, and of course larger amounts are needed. There should never be haste in the course of a sacral administration. Twenty minutes at least are required for the full development of the analgesia, and the actual injection of the solution must be firmly but quite deliberately carried out. Unpleasant symptoms have arisen only when large amounts have been used. These phenomena may be merely rapid pulse with slight nausea and dizziness, or they may be breathlessness with failing pulse or actual collapse. The administration of

oxygen and injection of caffeine appear to be the most effective remedies, but I have had no experience of treating serious symptoms caused by sacral injection. It appears to me highly probable that the adrenalin in the solution is the cause when these undesirable effects are produced, and if large amounts of solution are necessary I prefer to omit that ingredient.

Features of the analgesia. The height to which analgesia extends is uncertain, but depends largely, as has been said, on the amount of solution injected. The skin of the face may be quite insensitive after an injection of 100 cc. Sense of touch and of pressure is often not abolished although analgesia is at the same time quite satisfactory. The pressure of the knife's edge is realised but without any sensation of pain. Motor paralysis of the lower limbs is rarely complete. Ability to move the feet or toes has been present in most of my patients.

Safety. Experience up to the present shows that if sacral injection is confined to cases in which analgesia is required for the rectum, bladder, perineum or genitalia, if, that is to say, large amounts of solution are not injected, then the procedure is almost free from risk. When it is a question of higher levels of analgesia the chance of danger is greatly increased and it may well be doubted whether there is any advantage in sacral over intra-thecal spinal injection.

NEW ANÆSTHETICS.

By C. Langton Hewer, M.B., B.S.

THE four anæsthetics in common use, *i.e.*, chloroform, ether, nitrous oxide and ethyl chloride, are now so well known that we are apt to overlook the possibility of other agents being of practical use. In late years, however, a good deal of research work has been done on anæsthetic gases, and the two which hold out most promise at present seem to be ethylene and acetylene.

Ethylene.

The anæsthetic properties of ethylene have been recognized for many years. In 1864, Hermann[1] anæsthetized himself with ethylene and described the experience as being similar to that produced by nitrous oxide. Johannes Müller, Davy, Simpson, and Nunnelly all made similar demonstrations upon themselves. In 1876, Eulenberg,[2] and in 1885, Lüssem[3] published detailed observations upon animals. The latter produced satisfactory anæsthesia, using a mixture of 80 per cent. ethylene, and 20 per cent. oxygen. Since that date interest in ethylene appears to have lapsed until 1917, when Cotton,[4] having demonstrated that chemically pure diethyl ether had little if any anæsthetic action, showed also that ethylene dissolved in the ether produced an efficient anæsthetic. In 1920, Wallis[5] confirmed these observations, but carried the investigations a stage further by showing that ethylene prepared from different sources, *e.g.*, from sulphuric and phosphoric acids, behaved differently. He believed that most of the anæsthetic action of the ethylene was due to traces of Ketones, and demonstrated that a large number of these compounds were themselves anæsthetics. These researches have stimulated considerable interest in ethylene, and the recent experiments by Luckhardt and Carter[6] at Chicago, and by Brown[7] at Toronto have fully confirmed the results obtained by previous workers. There appears to be no doubt that ethylene has considerable advantages over nitrous oxide, and arrangements are now being made for an extensive trial

of the gas in this country, and it is hoped that the results will be fully published in a short time.

Acetylene.

The first mention of acetylene as an anæsthetic was possibly made by Lewin[8] in 1885. Ten years later, Rosemann[9] published detailed results in cats using from 15 to 20 per cent. by volume of acetylene. Since that date the objectionable odour has discouraged further investigations until recently when Gauss[10] has shown that chemically pure acetylene has little odour and even this trace can be disguised by oil of pine. Horwitz,[11] speaking of a personal visit to Gauss' clinic at Freiburg, states that over 500 cases have been successfully operated upon under a mixture of acetylene 40 per cent. and oxygen 60 per cent. The apparatus used by Gauss is extremely complicated, but in its essentials differs in no particular from a gas and oxygen machine. The advantages claimed from acetylene are good relaxation, rapid recovery and freedom from after effects. Wallis has found that pure acetylene (prepared from cuprous acetylide) dissolves in pure ether to a considerable extent and increases its anæsthetic power. On keeping, however, some chemical change apparently occurs, and the characteristic odour of acetylene becomes obvious.

These observations appear to be of great importance, and there seems no reason why a gas superior to nitrous oxide should not be found. At the same time, however, researches with ethylene and acetylene are by no means devoid of danger both to the experimenter and experimentee, and the wise Anæsthetist will do well to leave them severely alone until such time as their mode of action has been completely worked out.

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BOOK REVIEWS.

"Practical Local Anæsthesia and Its Surgical Technique." By Robert Emmett Farr, M.D., F.A.C.S., Minneapolis, Minn. London: Henry Kimpton.

For those who have the inclination and the opportunity the field of research in Anæsthesia is a broad one. Investigation may be conducted from such various standpoints as the physiological, psychological, chemical, pharmacological, mechanical and surgical. One has but to glance over the current bibliography or the programme of societies to realize how far the subject has been advanced since the days of Morton and Simpson. Aside from the more familiar general anæsthetics there is practically an unlimited field in local or regional anæsthesia, the extent of which is well illustrated by Farr's "Practical Local Anæsthesia," just to hand.

This work may be said to comprehend the entire field of local anæsthesia, and will be found useful for the surgeon as well as the anæsthetist. The chapters on Equipment and Technique are replete with information for those desiring to go into this branch understandingly, the author having reviewed such subjects as infiltration and conduction anæsthesia and their allies very learnedly. The portion of the book devoted to the practical application of local anæsthesia impresses one with the breadth of its possibilities, and evokes admiration for its commendable explicitness as well as the wide range of cases worked out.

A phase of the subject stressed by the author is what might be termed "extraneous" anæsthesia. He repeatedly refers to the value of the psychic element in anæsthesia, and goes so far as to employ a "psycho-anæsthetist" in many of his cases. This, undoubtedly, is a field to be investigated further.

A word must be said in praise of the large number of illustrations and their lucidity. Mr. Ralph L. Witherow, who is responsible for most of the drawings in the work, has again demonstrated the high degree of perfection the art of medical illustration has attained.

REMARKS ON BRONCHO-PULMONARY COMPLICATIONS FOLLOWING OPERATIONS UNDER ANÆSTHESIA.

By W. J. McCardie, M.B., B.C. (Cantab.),
Hon. Anæsthetist to the General Hospital, Birmingham, etc

IN my opinion the most important question in anæsthesia to-day is that which appears in the title of this, I fear, somewhat discursive paper. At the Annual Meeting of the British Medical Association in Glasgow last year, Dr. Lamb gave to the Anæsthetic Section an admirable and judicious opening presentation of this subject. His early statement that "graduates going out into the world from this School knew little of the peace of mind of the anæsthetist engendered by the use of ether," and "the number of fatalities occurring annually in this city from chloroform in the hands of comparatively inexperienced anæsthetists, would probably surprise, if not startle, the adherents of this old doctrine," and that many graduates from the Glasgow School are still under the impression "that the administration of ether is frequently, if not usually, followed by bronchitis and pneumonia or cardiac failure, and that whilst occasionally patients die on the table under chloroform, far more die after the operation from the above complications when ether is used," are remarkable in these days. I would suggest that the two latter statements be supported or contradicted by statistical evidence drawn from hospital and private practice in Glasgow and presented before a joint meeting of surgeons and anæsthetists.

In my own experience broncho-pulmonary complications are much more frequent in hospital than in private practice. I am unable to get correct figures of the former, but those I have recorded in about 14,000 hospital administrations are certainly far more proportionately. If we can find the causes of this difference we shall be helped in our enquiry, because, I take it, the anæsthetics used are the same in hospital as in private work.

I have kept a record of cases which occurred in private work from November 1898 to July 1922, and in 10,069 administrations of various anæsthetics by various methods for all sorts of operations, have noted 28 severe broncho-pulmonary affections, which occurred within three or four days after operation. Roughly these can be

classified as follows :—Bronchitis (severe), 10; pneumonia, including one septic, 16—five deaths; pleurisy, 2—one death; total, 28—six deaths; that is one case in 359, or about .3 per cent.

Deaths.

In five out of six ether was wholly or chiefly administered. Three of the fatalities were after high abdominal operations. One took place after an operation under chloroform for amputation of the breast.

In all fatal cases the patient was of middle age; that is, from 37 to 56 years.

Several other patients have died from pulmonary embolism, a condition which I consider is mainly due to the surgical intervention.

No post-mortem examinations were held.

In addition there happened recently what may be called a "pre-pneumonic" death; that of a man 56 years of age, a chesty person, of full habit, who died within 24 hours after high abdominal exploration, with every sign of respiratory exhaustion and embarrassment and secondary heart failure. He was found to be suffering from pancreatitis. E_2C_1 + ether freely and openly was the anæsthetic.

I have known of several other like cases.

Respiratory complications have occurred more frequently in recent than in former years (and more often in males than in females), largely owing to the more severe type of operations nowadays and to the fact that these occur in greater proportion in middle age.

The position in its most acute form is presented to us in some such case as this. A middle-aged patient who has rigid chest, cough, some emphysema, some degree of myocardial and arterial degeneration, undergoes a severe and prolonged high abdominal operation. Because of his poor condition and the severity of the operation the anæsthetic is ether. In such a case the site of operation, the exposure and chilling near the diaphragm and lungs, the strain of forced diaphragmatic breathing and surgical interference with it, perhaps a pillow under his ribs, the very deep anæsthesia, which so often can only be safely gained by etherization, the limitation of breathing by pain and bandages after operation, not to speak of exposure and chilling of the body in various ways, will not infrequently bring about pulmonary complications. Thus

many factions may come into action, responsibility for which both surgeon and anæsthetist may share. It is for us to discuss the factors, including the anæsthesia, which may influence the development of pulmonary complications.

Frequency.

In the early days of anæsthesia, chloroform was accused of causing bronchitis, and an irritative "chloroform bronchitis" was described. Recently ether is the only anæsthetic which has been severely and more or less unjustly incriminated. Many records, giving varying results have been published, and much literature has appeared, particularly in American journals.

Years ago McNaughton-Jones stated that in the course of about 30 years' practice he had never seen a case of severe pulmonary affection after ether narcosis.

Pridgin Teale, during more than 20 years of almost exclusive use of ether in private surgical work could only recall one fatal case of broncho-pneumonia.

Recently Kaathoven has recorded 2,500 anæsthesias under ether without serious complication and without pneumonia or bronchitis. He gives a little chloroform if relaxation be not obtained and uses light anæsthesia.

Bloodgood says that pneumonia has practically disappeared from his clinic since the routine use of local anæsthesia with gas and oxygen, with more careful pre-operative treatment and prevention and treatment of shock. Lately he has used open ether instead of gas and oxygen, with the same result. He says that the reduction of the amount of general anæsthetic by local anæsthesia is the essential factor.

On the extreme contrary, Sonntag is quoted years ago as having, in 38 ether narcoses, observed six pneumonias, four of which were fatal—a terrible state of things—and Kaathoven gives figures from an American hospital in which 18 pneumonias occurred in 1,800 cases, of which 13 were fatal; that is, 1 per cent. pneumonia, and .7 per cent. mortality. Between these extremes statistics vary very widely. Perhaps figures given by McKesson may be taken as an average. (In the majority of cases, I presume, the anæsthetic was ether.) He says that "in a compiled series of 39,438 operations under all forms of anæsthesia lung complications followed in 3 per cent. of the cases in which figures are available. There was a total

mortality of 1 per cent. Of these lung complications 48 per cent. were pneumonias; of the pneumonia cases 48 per cent. were fatal. I could quote further statistics.

There is generally a difference, no doubt, between incidence in hospital and private work, because hospital cases are often in a poorer condition orally and constitutionally, do not have so much individual attention, and are often anæsthetised by inexperienced anæsthetists. The hospital patient is usually returned to a general ward at about living-room temperature, while a private patient is sent back to what is practically a small recovery ward specially warmed, and is specially nursed.

The figures given by Drs. Lamb (70 per cent.) and Featherstone at the Glasgow Meeting last year, as to the number of patients from surgical wards who showed post-mortem evidence of chronic respiratory trouble are impressive. Their results show how careful we should be in our preliminary treatment and choice of anæsthesia. One cannot, unfortunately, as a rule get post-mortem records after deaths in private practice.

It has been said, "that for every death on the operating-table there are 50 deaths from the later pulmonary complications. It seems, therefore, a huge mockery that the safest anæsthetic is proven now to bring in its wake the largest post-operative fatality." This startling pronouncement appeared in an editorial article in the *Journal of the American Medical Association* about three years ago.

So many factors enter into the causation that probably no single cause can be incriminated. Anæsthesia cannot, however, be disregarded, otherwise there would be no object in choosing a particular drug or method for anæsthesia in "chesty" patients. Of these factors the more important appear to me to be—

1. Pre-existing respiratory affections.
2. Exposure before, during and after operation.
3. High abdominal operations.
4. Saturation, over-stimulation and consequent exhaustion by inhalation of stimulating anæsthetic vapour.
5. Middle and old age.

Surgical manipulation, especially in abdominal work, in which abdominal viscera or ducts are opened, may be followed by infection of the lungs. Sepsis, of course, may spread.

Depth of Anæsthesia.

Saturation by stimulating drugs may cause over-action of the lungs (forced breathing) and heart, and consequent exhaustion of these organs. I have often noticed that patients suffer less after what is sometimes called a "badly given" anæsthetic, that is, light and often intermittent anæsthesia, then after a so-called perfect one, and that there is then less tendency to respiratory complications.

We know that "after anæsthesia the power of the blood to destroy pathogenic bacteria is markedly reduced, so that the state of a man after a long anæsthesia is comparable to that of an alcoholic with bronchitis who has been sleeping off an overdose of alcohol in a doorway."

Exposure and Chilling.

According to a recent questionaire by Lumbard, in America, as to the most potent cause of pneumonia, 63 out of 130 anæsthetists replied, "exposure in some form or other." Warming ether vapour is said by Corlette to save less than one calorie per hour. He emphasizes the danger of cold, dry and draughty air. It has been found that Jewish patients in a poor quarter of New York used to suffer from post-operative lung troubles in hospital because they were insufficiently clad. When supplied with the warm clothing they were accustomed to things improved. "As to the close association of pneumonia with exposure there can be no question" (Osler).

Paralysis of the thermic centres is caused by deep anæsthesia, and the patient is for some time in the position of a de-cerebrate animal. Heat loss from over-work and sweating by a stimulant anæsthetic may be great. The air of the operating theatre should be warm, still and moist. Heat loss is more important in old than in young people. It is proportional to the superficial area of the patient, that is, depends upon the amount of heat loss from the surface. This surface may be largely increased during an abdominal section; as a matter of fact the fall in the patient's temperature is greater in abdominal section than during extra-abdominal operation. About 87.5 per cent. of heat is said to be lost through the skin, and about 10.7 per cent. through the lungs. Children and small people have a much larger skin surface in proportion to their weight than adults or larger people. These facts are significant in relation to prophylaxis.

Preparation.

Every effort should be made to minimize previous lung troubles by prolonged preparation, preferably rest in bed for some days and careful treatment of any lung lesions. Oral sepsis must be rigidly eliminated.

Ventilation.

One wonders what is the influence of the plenum system. There is certainly more constant draught with the latter. Would a draught tend to spread infection in the wards? Silk asserts that in open-air hospitals bronchitis is unknown after operation.

Site of Operation and depth of Wound.

Broncho-pulmonary complications are more frequent after abdominal operations, especially after high abdominal operations. William Mayo writes: "The pelvic peritoneum, through long experience, has acquired a remarkable resistance to infection, which is not shared by the peritoneum of the upper part of the abdominal cavity. To reach the general circulation from the lower part of the abdomen infective material must pass through the portal circulation of the liver, the great organ of protection. From the upper half of the abdomen infective material passes into the mediastinal spaces and reaches the general circulation direct, resulting in the complicating broncho-pneumonia, which is so often the cause of death in cases of septic peritonitis. This is particularly true of the central tendon of the diaphragm through which solid particles may pass." The nearer the site of operation is to the diaphragm, generally speaking, the greater the risk of lung infection.

Type of Patient.

The tendency to lung complications is greater in the older than the younger, in the stout than the thin and less in children. The work of the respiratory machine under a simulant anæsthetic is comparatively more severe in middle-aged and chesty persons than in younger patients, in whom complications are usually of the broncho-pneumonic type.

There is a "peritoneal" type of patient whose breathing is catchy and spasmodic when his peritoneum is interfered with. Such an one needs a very deep anæsthesia to ensure relaxation, so much so that a little chloroform is often necessary. His breathing

after operation is often unusually restricted by pain and spasm, aid he is more likely to develop some chest complication.

Season.

Season influences incidence, respiratory affections being, in winter, more frequent and exposure to cold is more likely to occur.

Nature of Anæsthetic Administered.

With regard to the particular anæsthetic and method of anæsthesia, we badly need more recent comparative figures. It is so easy nowadays to give ether by the open method and to safely saturate the patient that we are apt to forget that there are other anæsthetics, and that often a very light anæsthesia will wholly or temporarily suffice for the surgeon's need. The very fact that we avoid the use of much ether and resort to other anæsthetics in patients suffering from broncho-pulmonary diseases whenever we can shows that we admit it has some definite, though probably small, influence in increasing or producing pulmonary lesions. There is no doubt that among general anæsthetics gas and oxygen is less frequently followed by respiratory complications than any other. This is probably due to the lightness of the anæsthesia maintained and not to any inherent virtue in the mixture. One is apt to forget that a gas and oxygen effect can also be produced by ether and chloroform, if only one will try for it.

Aspiration from the mouth is not, even in these days, to be neglected as a cause, in spite of the administration of atropine. The Trendelenberg posture effectively prevents the development of aspiration pneumonia; in fact lung complications seem to be comparatively infrequent in patients who have been operated on in this posture.

Warm Vapour.

I cannot think that warming the anæsthetic vapours has much influence in lessening lung complications. I have frequently and for long periods administered cold ether or chloroform vapour through a mouth-tube directly to the epiglottis, and have never seen any after-effect, and have not known of any happenings when ether vapour has been administered intra-tracheally.

Epidemic.

Lung complications may be epidemic in a ward or affect patients in particular beds in a ward. I have known of a series in the same

ward more than once, and also of a sequence of two and three cases of pulmonary complications in the same private room. Hence it is not wise to put a patient to bed next to another suffering from pulmonary disease or in a room previously infected.

Exhaustion.

Exhaustion due to operation or the over-stimulus of anæsthesia may end in respiratory and cardiac weakness with consequent hypostatic "pneumonia."

Prevention.

Prevention should include:—

Prolonged preparation, say a week in big abdominal cases, especially where there is any affection of the upper air passages.

Cleansing of mouth, nose and tonsils.

Preliminary polyvalent vaccines, where indicated, and possibly the administration of digitalis to keep up blood-pressure and prevent circulatory stasis.

Proper choice of anæsthetic.

More local and regional anæsthesia, alone or combined with general anæsthesia.

No preliminary morphine in chesty or high abdominal cases and none after operation till pain occurs, because the return of respiratory control and activity is delayed. Morphine should then be given in such full doses as to prevent pain on deep breathing or coughing.

Light anæsthesia. It is concentrated vapour that kills and weakens vital function. As far as anæsthesia counts in the production of respiratory affections it is all important that it should be light. In the Mayo's Clinic the very lightest anæsthesia is used in the middle part of an abdominal operation.

Light bandaging.

Warmth during operation and recovery. The theatre temperature should be about 80°F. The patients should be returned to a warm recovery room, especially if abdominal cases, as warm as the theatre till shock is over. The patient's bed should be placed close to the fire or source of heat while he is away in the operating room and afterwards.

Kellog recommends during operation frequent cold compresses applied every five minutes to the patient's chest, which is rubbed

vigorously with a dry cloth each time the compress is changed. These applications prevent, he believes, pulmonary stasis during anæsthesia and promote deep breathing. After operation he places the patient at once in a warm pack and then has him rubbed down.

Atropine. It must be remembered that the effect of atropine in stopping secretion disappears a long time before chloroform or ether are eliminated from the lungs, and that, therefore, there may be continued irritation and possibly inhalation of mouth secretion during a prolonged recovery. I believe that it would be wise at times to give a second dose of atropine when the patient is returned to bed. Rapid recovery of consciousness should be promoted in every way, even by administration of oxygen, and possibly intra-tracheal insufflation of air or oxygen if the patient has been subjected to prolonged and deep anæsthesia.

Administration.

With regard to respiration through the nose or mouth, I am inclined to think that oral respiration is not always the better. Too free oral respiration, especially when an air-way is used, makes for very large and sometimes too forced (reflexly) intake of irritating vapour direct to the lungs; then saturation occurs with chilling, and, especially in certain types of open air-way, direct carriage of infection to the lungs from the mouth. The retention of an air-way indicates deep anæsthesia. The contact of the air-way with the deep and sensitive parts of the throat seems to stimulate respiration. Very free mouth breathing takes the vapour to every part of the lungs without filtration and warming by the nose. Because of its congesting and irritating properties ether cannot usually be freely breathed through the nose, hence is needed an open mouth or oral air-way. With chloroform there is no need for a mouth tube because respiration, being shallow, the less irritating vapour can be usually respired through the nose and is not carried to the very bases and apices of the lungs. Thus the condition is like that of ordinary sleep and the vapour is warmed and filtered.

Forcible breathing may convey toxic mouth material to the hitherto sterile trachea and bronchi, and is therefore often better damped down by the administration of morphine.

I am not satisfied that the open method of administering ether is the better from the point of view of lung complications. I fancy, and I know of surgeons who agree, that these are less likely to

occur after a closed than after an open administration. There used to be an old, and I believe true, idea that half an hour's etherization was enough for any patient, and that thereafter change should be made to chloroform.

When safety is well established there is no need for over-stimulation. After all, what is stimulation but irritation?

The ideal anæsthesia is that in which respiration, circulation and blood-pressure are kept throughout about normal, but nowadays, owing to the severity of operation we have to allow a fairly large margin of immediate safety during it.

It would be interesting to have figures showing any lung complications after the newer drugs, *e.g.*, Cotton process ether and ethanesal.

With regard to special methods of anæsthesia, such as intra-tracheal, rectal oil-ether, gas-oxygen, local anæsthesia, we, at any rate, in this country, rarely hear of any after-complications, but Mikulicz, Griffin and some other writers state that chest complications are almost as numerous after local as after general anæsthesia.

Types of Lesion.

Very definite types are described, and in series so defined that one wonders that the particular type so overwhelmingly predominates in the particular hospital.

Pulmonary embolism is generally sudden and fatal, most common after pelvic operations, next after gall-stone operations. It is generally due to mechanical action causing local injury, and therefore need not concern us much.

Pulmonary infarction is characterized by sudden onset and subsidence. It occurs a few days after operation, is not very fatal, is due to trauma, mobility of the part or sepsis. It is said that there is no proof that chilling is the cause.

Inhalational complications follow previous infection of the respiratory passages, or pulmonary disease, *e.g.*, bronchitis, especially in the middle-aged after high abdominal operation. They occur immediately and early, and disappear gradually. The mortality is high.

Massive collapse of the lungs may result from paralysis of, or acute inflammation in the neighbourhood of, the diaphragm, the diaphragm being the direct expander of the lower ribs. It may closely simulate pneumonia, and sometimes subsides in 24 hours.

It may become inflamed. There are signs of consolidation and the heart is displaced to the affected side.

There may occur septic pneumonia, bronchitis, pleurisy, hypostatic pneumonia, pulmonary œdema or mucus inundation.

At the meeting of the section of Anæsthetists in Glasgow last year Dr. Lamb suggested that a questionaire to anæsthetists and hospitals be sent out. This I think should be undertaken by the Societies of Anæsthetists. We want to know what proportionate influence anæsthesia *per se* has in the causation. We wish to know what is the difference between hospital and private records and why this difference exists. We want also to know the influence of the particular anæsthetists and methods of administration and to appraise the various other important factors.

Conclusion.

There are very many factors which have varying importance in the causation of broncho-pulmonary complications. I am forced to the conclusion that general anæsthesia in some degree influences the incidence of broncho-pulmonary complications, and that the proper choice of the anæsthetic, degree of anæsthesia, and method of administration, are important factors in prevention. Etherization, especially if deep and prolonged in certain types of, and especially the chesty type of, patient and particularly in high abdominal operations, may be influential, especially if accompanied by exposure. The combination of local or regional with general anæsthesia should be employed if possible in all cases where there are pre-existing respiratory lesions and oxygen freely added to conserve respiration. Prolonged preliminary preparation and careful after treatment of patients subject to any form of nasal or respiratory catarrh or chronic respiratory lesions is essential.

It is for us, as anæsthetists, to elucidate and apportion the value of these factors, and by observing, freely and frankly recording, discussing and publishing our results to help in eliminating them. To this end the anæsthetist needs the collaboration of surgeon, physician, radiologist, pathologist and nurse, and especially that of the surgeon before and during operation.

ABSTRACTS OF CURRENT ANÆSTHETIC LITERATURE.

La Presse Médicale, 3rd Jan., 1923.

J. DUMONT describes *a simple form of gas and oxygen apparatus* invented by Desmarest and Amiot, and declares that the object of the communication is to convince French surgeons that their prejudices against this method of anæsthetizing are mostly unjustified. He says that he was not altogether impressed by what he saw of the method in war hospitals, and that he drew the conclusion that the quality of the anæsthesia produced often bore an inverse ratio to the complication of the apparatus employed; and that good anæsthesia depended more upon the clinical judgment of the administrator than upon mechanical regulation of the dose. The apparatus described is simple and portable, and, during administration, can be placed on the table beside the patient's head; it will deliver any mixture of gas with oxygen or ether or air, but the author does not consider it necessary to give oxygen when ether is being employed. Dr. Dumont adds a word of warning with reference to the use of morphia in children, or in anæmic, shocked or cachectic subjects, as he considers it may increase the tendency to nausea and vomiting.

MARC ROUSSIEL, in an article entitled *Anœsthesia of the Splanchnic nerves and of the superior and inferior mesenteric plexuses*, describes a simplified form of paravertebral anæsthesia produced by a single puncture on each side of the twelfth D.V. which renders insensitive the stomach and portion of large and small intestine, and to which is added local or regional anæsthesia of the abdominal wall. In operations involving the descending colon, the spleen, or the kidney, a modification of the technique is necessary, by means of which, without a fresh puncture, the anæsthetic fluid is injected into the cellular tissue on either side of the first L.V. It is found that by means of this slight modification a more complete anæsthesia is obtained both of the viscera and of the posterior parietal peritoneum.

La Presse Médicale, 17th Jan., 1923.

Prof. G. COTTE of Lyon advocates *regional anœsthesia in operations on the uterus*. His cases have included dilatations and curettages, also cervical myomectomies. The technique consists in pulling down and fixing the cervix, and injecting a 1 per cent. solution of novocain into the base of the broad ligaments, and, if possible to locate them, into the utero-sacral ligaments, as well as infiltration around the neck of the uterus. The author claims that by this means dilatation is rendered rapid and easy.

La Presse Médicale, 17th Jan., 1923.

LOUIS JUBE describes a very *ingenious form of syringe* (capacity 15 ccm.) for use in blood transfusion. The apparatus is placed between the arm of the donor and that of the recipient, and is connected with the respective veins by short rubber tubes. There are no valves, but a " valve " action is obtained by means of a groove cut in one side of the plunger of the piston and extending from one end of it to within half an inch of the other end; the plunger is a little more than half the length of the barrel, and thus always overlaps the afferent and efferent parts which are situate opposite one another at a point midway between the two ends of the syringe. The " valve " action is obtained by rotation of the piston through 180 deg. which brings the groove in the plunger opposite the intake port during withdrawal of the piston, and opposite the outlet port while the piston is being pressed in. It is claimed that owing to the absence of mechanical or chemical injury to the blood smaller doses are necessary than when citrated blood is used, 100 to 150 gr. being always sufficient.

La Presse Médicale, 7th Feb., 1923.

BLOCH and HERTZ recommend the *intrathecal injection of caffein* as a remedy for syncope resulting from spinal anæsthesia.

The authors show that the action of caffein is antagonistic to that of novocain, and for this reason the administration of this drug before, or together with, the spinal injection of novocain, as a means of preventing the occurrence of syncope proved disappointing. But its employment as a curative when faintness threatened or had developed gave remarkably satisfactory results, and seemed to undoubtedly avert a fatal issue.

The dose of caffein used varied between 25 and 60 cgms. and it was injected intrathecally.

La Presse Médicale, 25th April, 1923.

Blocking of the bulbar centres by novocain in man. R. SOUPAULT.

In 1912 Jean Camus showed that in dogs the bulbar centres could be blocked by the injection of chlorotone through the orcipito-atloid membrane, and that the different centres were always affected in the following definite order: that for vomiting; for co-ordination; for respiration; for cardiac control; for vaso-motor control; and that for secretion. In fact he demonstrated that so vital a centre as that for respiration could be functionally paralysed without the mental processes being in any way affected.

Similar experiments were performed in 1921 with stovain and novocain. And now, by chance, the author has met with similar phenomena in man. A patient, aged 33, was given 10 cgrms. novocain by injection in second lumbar space for appendicectomy; anæsthesia was satisfactory, but 40 minutes after injection, when about to be

returned to bed, he became very pale and lay with eyes half closed and with limbs motionless, respiration had ceased, but the pulse remained good. Artificial respiration was kept up for three-quarters of an hour before spontaneous respiration was re-established. During this time the patient was able to move his head, look round, and smile; he also spoke, and when asked why he did not breathe he answered " because there is no air "; he showed resentment when the flagillation of his face was too vigorous, and at the end of half an hour he complained that his ribs were becoming painful; for phonation he depended upon the current of air produced by the artificial respiration.

When breathing recommenced the patient suddenly went into a state of spasm, with opisthotonos, extension of the arms, deviation of the head and eyes to the right, trismus, and grinding of the teeth. This crisis was repeated six times in all. Complete recovery took place.

La Presse Médicale, 19th May, 1923.

Persistent hiccough after operation. Prof. A. LATRONCHE (Poitiers).

A male patient, aged 52, underwent nephrotomy for calculus pyelonephritis, chloroform anæsthesia being used. The operation was perfectly normal, and nothing untoward occurred until the evening following it, when hiccoughs supervened; these were slight at first but soon became intense and frequent, 60 in the minute, rendering sleep impossible and the taking of food very difficult.

All treatment, including morphia, failed to even moderate the spasms, and it was determined to try the effect of ether given hypodermically, as this treatment had been used with success in whooping cough. The hiccough had persisted for seven days when the first injection of ether was administered, 10 ccm. being employed. After half an hour hiccough ceased but returned again during the night. Next day 6 ccm. ether was injected, after this recovery was complete and permanent.

Gazette des Hopitaux, Jan. 27th, 1923.

G. JAUNENEV and J. TAUZIN of Bordeaux, in an interesting article on *surgery in patients with reduced blood pressure*, discuss the problem of choice of anæsthetic method, and sum up their conclusions with the sentence: " Everyone knows that chloroform should be avoided, that spina is in itself a depressant except in minute doses, and that ethyl-chloride, or ether, or better still, local analgesia, should be employed."

Gazette des Hopitaux, April 19th, 1923.

Shock in connection with traumatism of the abdomen. M. G. BLECHMANN.

While at the " front " in 1916 the author was struck with the disproportion existing between the extent of wounds and the severity

of the shock resulting. In the course of his investigations he made observations on the blood pressure in order to find out to what extent this was affected by the trauma of operation on various parts of the body. He found that blood pressure was hardly disturbed by manipulation of the contents of the cranium, or of the chest; but that it was markedly lowered when the limbs or the contents of the abdomen or the pelvis were subjected to operation. In studying the sensitiveness of the peritoneum he observed the change produced by the introduction of ether into the abdomen, a procedure much in favour at the time, and found that a serious fall invariably resulted; in one case the pulse remained imperceptible for 50 seconds. A change in the blood pressure accompanied every surgical manipulation of the peritoneum or viscus. In an appendicectomy performed under local analgesia the pressure fell sharply during various manipulations, but rose again to normal during the intervals of "rest."

Le Progrès Médicale, May 12th, 1923.

Nitrous-oxide in surgery. M. CHIFOLIAU.

In his introductory remarks the author regrets that Parisian surgeons have been slow in adopting this method, which he admits to be more difficult and less convenient than chloroform or ether but which he regards as safer and better for the patient. He deprecates the American and English custom of adding ether or chloroform, as he considers this introduces an unnecessary element of danger; but he also realises the need for patience on the part of the surgeon owing to the fact that relaxation is not complete in many cases until the patient has been unconscious for 15 or 20 minutes. The question of safety is gone into, and reference is made to accidents which have been reported from other clinics, these include instances where death resulted from the gas containing CO_2, in one case to the extent of 18 per cent. In another instance death resulted from hemiplegia following operation for carcinoma of the breast, and the author suggests that the combination of scopolamine and nitrous-oxide has a tendency to produce a marked rise of blood-pressure. In conclusion the suggestion is made that this method ought to supersede ether, chloroform, ethyl-chloride, and spinal anæsthesia.

Franco-Belgian Archives of Surgery, March 1923.

General anæsthesia with ethyl chloride-alcohol. RENE REDING (Brussels).

The author feels that owing to faulty technique ethyl chloride has of late been undeservedly neglected, although previously it was the subject of much investigation and work; and that up to the present time opinion is divided as to its innocuity, its indication and its mode of employment.

This article is based on an experience of nearly 5,000 cases in which the drug was mixed with 10 per cent. alcohol so as to raise the

boiling point from 12 deg. to 26 deg., and is administered on an open mask instead of by means of any form of closed apparatus; one essential of the technique to which the author attaches importance is the avoidance of deep narcosis; in fact the pupil is kept small and the cornea sensitive. By this means and by the avoidance of the upright (sitting) position he claims to reduce the danger of syncope to a minimum even in shocked or enfeebled subjects. And he points out that a large proportion of the accidents reported with closed methods have occurred in patients sitting in dentists' chairs.

The author regards the most obvious indication for ethyl chloroide to lie in introducing other anæsthetics, such as ether or chloroform, and in short operations; but he refers to cases of more than an hour's duration which, however, he considers to belong to the specialist's province. He advocates its usefulness as a complement to local analgesia.

In the instance of excitable or alcoholic patients, or in the subjects of epilepsy or hysteria, it should not be used without a preliminary injection of scopolamine and morphia. A. L. FLEMMING.

American Journal of Surgery—Quarterly Supplement of Anæsthesia and Analgesia, April, 1923.

*Some unusual complications of nitrous oxide-oxygen anæsthesia. ANSEL M. CAINE.

*Blood pressure during surgical operations under general anæsthetics. MORRIS H. CLARK.

Circulatory changes during anæsthesia. JOHN R. WORLEY.

The physiological effects of nitrous oxide. NEIL C. TREW.

Intratracheal insufflation anæsthesia. MARY KAVANAGH.

Anæsthesia as a part-time specialty. MOSES SALZER.

The anæsthetist on the hospital staff. CHAS. H. SANFORD.

Oxygen in the peritoneal cavity: with case reports. WM. S. BAINBRIDGE.

General anæsthesia in submucous and other nasal operations. J. G. POPE.

Some unusual complications of nitrous oxide-oxygen anæsthesia.

The author reports four mishaps: one death immediately following operation of cholecystostomy; another, two months after removal of gall-bladder and appendix; a third, immediately following an appendicectomy; and the fourth case paralysis and blindness for several years.

In summarising his cases he reaches the following conclusions:—

1. If the heart stops because of overdose of nitrous oxide, and under-dose of oxygen, and remains inactive for a minute in the human being, the chances of recovery to normal are not good.

2. Restoration of heart's action and respiration does not mean that the patient is all right, but there are likely to be degenerative changes in the brain that are irreparable.

3. Restoration of consciousness and apparent normality after the heart has stopped under these circumstances does not mean that there is no permanent damage to the brain that will be manifested later.

4. The human brain cannot stand the suspension of circulation and return to normal as can the brain of the dog.

5. The pupils are not a safe guide to saturation, as there are too many exceptions to the rule of dilatation, and these exceptions, when the pupils are depended upon, are too important.

6. The respiration is a much safer guide than the pupil. When respirations slow to almost stopping point, even if deep, it is time to add more oxygen if one is saturating. When the eyeballs turn inward and become fixed, saturation is complete or almost so, independent of the pupil, and oxygen should be added at once. If respirations stop during saturation without any delay at all inflate lungs with oxygen, or with a high percentage of gas and oxygen (25 to 50 per cent. oxygen).

7. Nitrous oxide and oxygen anæsthesia is safe as long as sufficient oxygen is given, but when the oxygen is discontinued for the purpose of saturation in order to secure relaxation, the greatest attention is demanded and the respiration should never be allowed to fail.

Blood pressure during surgical operations under general anæsthesia.

The author classifies the changes in the cardiovascular system during anæsthesia, as (*a*) those due to the anæsthetic, and (*b*) those due to the operative procedure. Under (*a*) he states that chloroform produces slight stimulation during induction and marked depression later. Ether produces marked stimulation during induction and a more gradual onset of the depression period. Nitrous-oxide produces less change in the blood pressure than ether or chloroform.

In this connection is mentioned the pressure-raising property of carbon dioxide.

Under (*b*) he states that factors entering into vasomotor disturbances, are (1) hæmorrhage; (2) trauma; (3) fear; (4) posture during operation; and (5) sudden reduction of cerebral or abdominal pressure (in those cases in which it is previously abnormally high).

" Cerebro-Spinal Pressure Anæsthesia."

Dr. Toshiro Kokubu describes, as reported in the *Japan Medical World* of February 15, 1923, a new method of anæsthesia. He found that " by raising the cerebro-spinal pressure " in the dog there developed just the same stages met with in chloroform or ether anæsthesia, *i.e.*, " a stimulating stage, a somnambulic stage, and a spasmodic stage." In the somnambulic stage there was manifest a general anæsthesia which could be harmlessly continued by regulating the pressure long enough to complete any operation in the dog without pain. The removal of the cerebro-spinal pressure resulted in the " somnambulic " stage passing off.

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SOCIETY REPORTS.

SCOTTISH SOCIETY OF ANÆSTHETISTS.

At the meeting of the Scottish Society of Anæsthetists, held in Glasgow on May 26th, Dr. J. S. Ross communicated two unusual cases of intratracheal anæsthesia. The first was a young man with a rapidly increasing goitre causing marked obstruction of respiration. He was anæsthetised by a mixture, and, as expected, the air-way became completely obstructed at the end of the induction. An intratracheal catheter was introduced by the direct method. It was then found that while air could be freely introduced along the catheter into the chest, the walls of the trachea enclosed the catheter so closely that no reverse current of air could take place. The warning note was given by the increase of pressure in the intratracheal instrument itself causing escape from the safety-valve, examination showing that no air was escaping through the mouth. The anæsthesia was conducted by alternately connecting and disconnecting the apparatus with the catheter. Enucleation of the goitre was effected very rapidly, after which all difficulty disappeared and the man made an excellent recovery.

The second case was one of retro-sternal goitre. In the light of the experience of the previous case it was regarded as possible that a similar difficulty might be experienced in this case, but in actual practice the induction of anæsthesia, the introduction of the tube and the earlier stages of the intratracheal anæsthesia proceeded smoothly. At a later stage of the operation, however, an obstruction of the outflow did actually occur. The operation was one of very considerable difficulty and while the patient left the table alive, death took place some few hours later, apparently from shock. It was also noted that there was a considerable amount of hæmorrhage during the operation.

Dr. FAIRLIE stated that he had met with two cases, one of epithelioma of the tongue and the other glands in the neck, anæsthetised by the intratracheal method, where the return flow of air had been obstructed. Both patients were of the short-necked type and obstruction was removed simply by keeping forward the jaw. There was no spasm of the glottis.

Dr. THOMSON said he had never met any case of obstruction so long as the tube was in position, but to his knowledge two cases had died after the return to bed some considerable time after the tube had been removed.

Dr. J. H. GIBBS mentioned a case which he would have to anæsthetise within the next few days: a very stout lady who had suffered for many years from asthma and who now had a markedly dilated heart with signs of blood pressure. The removal of a septic tooth was absolutely essential to give the patient comfort and a local anæsthetic would, in his judgment, be impossible. He proposed to deal with the case by open ethyl-chloride with oxygen run into the corner of the mouth, and this procedure appeared to be regarded by most members as very suitable.

AMERICAN AND PACIFIC COAST ANÆSTHETISTS.

A Joint Meeting of the American and Pacific Coast Anæsthetists, with the Section on Anæsthesiology of the California State Medical Society, was held at San Francisco, June 22—26.

Among the items on the programme were the following:—

The Effects of Posture on Relaxation Under Anæsthesia. Caroline B. Palmer.

Reversing Anæsthetic By-Effects through Selective Medication. Lorulli A. Rethwilm.

Spinal Anæsthesia for Upper Abdominal Operations. L. L. Stanley.

Sacral Anæsthesia for Recto-Colonic Operations. A. J. Murietta.

Spinal Anæsthesia in Obstetrics and Cæsarean Section. H. T. Cooke.

Anæsthesia for Oral Surgery with special reference to the Dangers and Advantages of the Beck-Mueller Apparatus. Walter R. Crane.

General Anæsthesia in Nose and Throat Surgery Hypodermically Administered. Isaac H. Jones.

Pure Nitrous Oxide Oxygen for Oral Surgery in the Upright Posture. E. I. McKesson.

Selective Anæsthesia for Plastic Surgery of the Mouth and Jaw. Frank Chandler.

Keeping Anæsthetic Records and What They Show. John S. Lundy.

Medico-Legal and Obstetrical Considerations of Scopolamine Anæsthesia. R. E. House.

Ethylene-Oxygen Anæsthesia: Research and Clinical Considerations. A. B. Luckhardt and Isabella C. Herb.

Pre- and Post-Operative Care of Patients from the Anæsthetist's View-point. R. F. Hastreiter.

Anæmia in Relation to Surgery and Anæsthesia. W. H. Gilbert.
Evaluation of Cardiac Reserve. Alfred Friedlander.
Heart Complications in Anæsthesia. J. M. Wilson.
Shock from the Anæsthetist's View-point. Neil C. Trew.
Anæsthesia for Hazardous Brain Surgery Risks. Dorothy A. Wood.
The Goitre Risk and a Simplified Technique of Local Anæsthesia. John Hunt.
Positive Pressure for Thoracic Surgery with Nitrous-Oxide-Oxygen Anæsthesia. Sterling Bunnell.

Anæsthetic Clinics were held at Lane Hospital, Stanford University, and at the University of California. Laboratory demonstrations were given at the University of California Medical College.

CANADIAN SOCIETY OF ANÆSTHETISTS.

At the Third Annual Meeting of the Canadian Society of Anæsthetists held at Montreal, June 12—14, the following papers were amongst those read :—

Further Studies in the Pharmacological Effect of Impurities in Anæsthetic Ethers. Walter L. Mendenhall and A. W. Rowe.
Observations upon some Reflex Effects of Ether. M. S. Dooley.
Diabetic Coma in Relation to Surgery and Anæsthesia. F. G. Banting.
The Anæsthesia Problem in Exophthalmic Goitre. Don. A. Warren.
Preliminary Medication. Robert Hammond.
Psychology in its relation to the Anæsthetist. John J. Buettner.
Shock Prophylaxis. Charles J. Wells.
Fatty Degeneration of the Liver following Ether Anæsthesia. Wm. B. Howell.
Effects of Ether Anæsthesia on Afferent Paths in Decerebrate Animals. A. Forbes and R. H. Miller.
Nitrous-Oxide-Oxygen for Cystoscopy. G. M. Geldert.
Carbon Dioxide Administration after Anæsthesia. James R. White.

Anæsthesia Clinics were held in the Montreal Hospitals, and Laboratory Demonstrations were given in the new McGill University Buildings.

"The verdict of those best qualified to judge assigned the credit of the ether discovery to Morton. Yet the man went unrewarded,—his life apparently a failure, his practice destroyed, his family scattered, ruined, and wretched, his health broken, and premature death, a happy release from a harassed and miserable existence."—*Medicine in America,* Mumford.

DIRECTORY OF ANÆSTHETIC SOCIETIES.

Section of Anæsthetics, Royal Society of Medicine. Council: President—A. L. Flemming, M.B.; Vice-President—H. G. Shirley, C.M.G., M.D.; Hon. Secs.—G. Ramsey Phillips, Charles F. Hadfield, M.D. Other Members of Council—H. P. Crampton, M.D., Ashley S. Daly, W. Howard Jones, M.B., C. J. Loosely, H. R. Phillips, M.D., F. S. Rood, M.B. Representative on Library Committee—Frances May Dickinson Berry, M.D.; Representative on Editorial Committee—J. Blomfield, O.B.E., M.D.

There will be a meeting at Birmingham on Saturday, Dec. 1st, 1923.

The *Anæsthetic Section* of the *British Medical Association.* Annual Meeting at Portsmouth, Thursday, July 26th.

Papers: Dr. Harold Sington (London), Anæsthesia for Children; Dr. Arthur L. Flemming (Bristol), Fatalities from Anæsthetics; Dr. H. E. G. Boyle (London), Paper and Demonstration of Apparatus for Administration of Gas, C.E., and Oxygen.

Officers of Section: President—W. J. Essery, C.V.O., M.B.; Vice-Presidents—H. E. G. Boyle, O.B.E., M.R.C.S., L.R.C.P., Wm. Carling, M.B., B.Ch., C. H. Mott, M.R.C.S., L.R.C.P.; Hon. Secs.—R. H. Emmett, M.A., M.R.C.S., L.R.C.P., H. R. Philipps, M.D.

On Friday, July 27th, before the Section on Surgery, there will be a discussion: Anæsthetics from the Surgeon's Point of View, to be opened by Mr. Wilfrid Trotter, followed by Sir Wm. de Courcy Wheeler and Drs. A. L. Flemming, J. Blomfield, and A. E. Boyd.

Scottish Society of Anæsthetists. President—Dr. J. H. Gibbs, Edinburgh; Vice-President—Dr. H. P. Fairlie, Glasgow; Hon. Sec. and Treasurer—Dr. J. S. Ross, Edinburgh; Executive—Drs. H. Jones, D. Lamb, Alex. Ogston, and A. Mills.

One ordinary meeting upon some Saturday in May.

Canadian Society of Anæsthetists. 100 Members. President—David H. Arnott, M.D.; Secretary—Wesley Bourne, M.D., 34, St. Mark Street, Montreal.

American Association of Anæsthetists. 1,200 members. Secretary and Treasurer—F. H. McMechan, M.D., Lake Shore Rd., Avon Lake, Ohio.

National Anæsthesia Research Society. President—E. I. McKesson, M.D., Toledo, Ohio.

A second Congress in joint meeting with the Inter-State- and Mid-Western Anæsthetists will be held at Chicago, Oct. 22—24, 1923, during the Clinical Congress of Surgeons.

Pacific Coast Anæsthetists. Secretary—Treasurer—Eleanor Seymour, M.D., 845, West 10th Street, Los Angeles, Cala.

Southern Association. Secretary—Treasurer—W. Hamilton Long, M.D., Louisville, Ky.

Second annual meeting at Washington, D.C., Nov. 12—14, 1923, conjointly with the Southern Medical Association.

Associated Anæsthetists. General Secretary—F. H. McMechan, M.D., Lake Shore Rd., Avon Lake, Ohio.